Performance Evaluation Review 2017 vol.44 N4, pages 80-90

Characterization and evaluation of mobile crowdsensing performance and energy indicators

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Abstract

Mobile Crowdsensing (MCS) is a contribution-based paradigm involving mobiles in pervasive application deployment and operation, pushed by the evergrowing and widespread dissemination of personal devices. Nevertheless, MCS is still lacking of some key features to become a disruptive paradigm. Among others, control on performance and reliability, mainly due to the contribution churning. For mitigating the impact of churning, several policies such as redundancy, over-provisioning and checkpointing can be adopted but, to properly design and evaluate such policies, specific techniques and tools are required. This paper attempts to fill this gap by proposing a new technique for the evaluation of relevant performance and energy figures of merit for MCS systems. It allows to get insights on them from three different perspectives: end users, contributors and service providers. Based on queuing networks (QN), the proposed technique relaxes the assumptions of existing solutions allowing a stochastic characterization of underlying phenomena through general, non exponential distributions. To cope with the contribution churning it extends the QN semantics of a service station with variable number of servers, implementing proper mechanisms to manage the memory issues thus arising in the underlying process. This way, a preliminary validation of the proposed QN model against an analytic one and an in depth investigation also considering checkpointing have been performed through a case study.

http://dx.doi.org/10.1145/3092819.3092829

Keywords

Checkpointing., Energy consumption, G/G/x, Mobile Crowdsensing, Performance, Queuing networks

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